



Collaboration and Comparability

The Intergovernmental Task Force on Monitoring Water Quality

In 1992, the United States' Office of Management and Budget (OMB) issued an official statement requiring the review and evaluation of national water quality monitoring activities and the development of recommendations for improvements. Later that year, the Intergovernmental Task Force on Monitoring Water Quality (ITFM) was formed to respond to this challenge. ITFM's charge was to develop a voluntary, integrated, nationwide monitoring strategy.

During its three-year duration, the Task Force was chaired by the United States Environmental Protection Agency (USEPA) and co-chaired by the United States Geological Survey (USGS). Members of the task force included representatives from federal and state resources agencies. After three years of work, the ITFM produced its final report containing principal recommendations on many issues including:

- monitoring framework
- data collection methods
- environmental indicators
- data management
- assessment and reporting approaches

Creating a framework for collaboration and comparability, among programs, was identified as one of the goals necessary to the development of a national monitoring strategy. One of ITFM's principal conclusions was that true collaboration among programs is possible if there is both the technical and institutional framework to promote data comparability to assure data of known quality.

In May, 1997 the National Water Quality Monitoring Council and the Methods and Data Comparability Board were chartered under the Federal Advisory Committee Act (FACA), succeeding ITFM. The Council's charge is to implement a nationwide strategy to improve water quality monitoring, assessment and reporting, and oversee the activities of the Methods Board. The Board's role is to provide the framework and forum for comparing, evaluating and promoting monitoring approaches that can be implemented in all appropriate water quality monitoring programs. Collaboration and comparability are the keystones of the Board's efforts.

Why focus on collaboration and comparability?

Each year, government agencies (local, state, tribal, and federal), industry, academic researchers, and a wide variety of private organizations in the United States devote enormous amounts of time and several billion dollars to the monitoring, protection, and restoration of water resources and watersheds. This work includes:

- monitoring the status and trends in water quality
- identifying and ranking existing and emerging problems
- designing and implementing resource management programs
- determining compliance with regulatory programs

The information gathered through these activities is certainly useful to the data collectors themselves. However, critical differences in project design, methods, data analysis, and data management have often made it difficult for monitoring information to be shared by other potential data users. Accurate, cost-effective and efficient assessment of the nation's water resources—within and among watersheds—requires that monitoring entities work collaboratively and strive for comparability in methods and data management. The design and implementation of assessment and management programs should be a cooperative product of the various monitoring agencies and organizations active in any given watershed.

The Methods and Data Comparability Board (MDCB)

In order to work toward the goal of comparability, ITFM recommended the formation of the Methods and Data Comparability Board (MDCB).

The Methods Board is a partnership of water quality experts from Federal agencies, States, Tribes, municipalities, industry, and private organizations. It is chartered under the National Water Quality Monitoring Council.

The Board's challenge is to identify, examine, and recommend monitoring approaches that facilitate collaboration and yield comparable data and assessment results.

Methods and Data Comparability Framework

Element	Description	Relevant MDCB Activities *Future activity planned
DQO/MQO Development-Definition ↓	<ul style="list-style-type: none"> • Sampling design • Data quality • Study objectives • Monitoring question 	<ul style="list-style-type: none"> • DQO paper* • Nutrient pilot* • PBMS paper • COD Pilot • NEMI
Sample Collection Field Method Performance ↓	<ul style="list-style-type: none"> • Field sampling methods • Sample handling/preservation • Training 	<ul style="list-style-type: none"> • Field Biological PBMS Paper • Macroinvertebrate Pilot* • Nutrient Pilot*
Laboratory Analysis Performance ↓	<ul style="list-style-type: none"> • Lab Accreditation • Reference Materials Available • Lab Method Verification 	<ul style="list-style-type: none"> • Federal Lab Accreditation Paper • Coordination with NELAC • PBMS Paper • COD Pilot
Data Reporting	<ul style="list-style-type: none"> • Required metadata • Data quality documentation 	<ul style="list-style-type: none"> • Water Quality Data Elements (WQDE) • National Environmental Methods Index (NEMI)

Four key elements anchor the framework of the Board's efforts. This framework is displayed above.

The Board is a product-focused organization whose activities are designed to promote and support the key elements of the framework. Specifically, the Board will:

- prioritize methods and parameters in need of comparability assessments
- develop technical guidelines for ensuring and documenting data comparability
- develop and promote a performance-based methods system (PBMS)
- participate in establishing reference methods
- develop technical guidelines for methods validation and comparison of new methods to reference methods.
- promote a national laboratory accreditation program and prelaboratory certification program
- identify and support programmatic needs for methods comparison exercises

Methods Board membership

The Board has 15 voting delegates, up to 15 alternates, and non-voting technical work-group members as needed, representing all geographic areas of the U.S. The members have a wide variety of technical and administrative experience related to monitoring methods issues as well as field and laboratory expertise in chemical, physical, and biological water monitoring methods.

Voting and alternate delegates are equally represented among each of the three major sectors: federal agencies, state/tribal government agencies, and other monitoring interests. Delegates representing these sectors will work to facilitate the Board's efforts to achieve its goals and to promote participation of the private sector as well as governmental agencies.

How can the Methods Board help your program?

The expertise and national representation on the Board will provide many benefits to both data generators and data users including:

- project cost-savings
- strengthened foundation in quality assurance (QA) and quality control (QC)
- potential reduction in number of sites sampled
- technical assistance in study design for methods assessment and analysis
- increased ability to use data produced by other programs
- increased ability to use historical datasets

The following examples demonstrate how the Methods Board can help your program.

Sample Methods Board activities

Advocate performance-based methods (PBMS Workgroup)

The PBMS Workgroup has investigated numerous aspects of performance-based systems with the goal of developing the most straightforward set of criteria to allow laboratories and monitoring program designers to effect cost savings by using state-of-the-art methodologies, and being able to compare results from different programs in a consistent manner, while strengthening quality assurance standards. In 1999, the workgroup developed a criterion document outlining the critical factors necessary to ensure that PBMS-based programs would meet these goals and distributed this document among interested parties. A copy of the PBMS Position Paper is available on the MDCB website.

In 2000, the workgroup undertook a pilot study to test these criteria, using a new mercury-free COD test method as the basis for the pilot study. In this study, conducted with the cooperation of 8 laboratories representing a variety of user types, the new method was evaluated using two separate approaches: the new method was evaluated against a set of DQOs/MQOs (Data Quality Objectives/Measurement Quality Objectives) established by the workgroup; the new method was also evaluated by comparison to a currently USEPA-approved COD method, used as a reference method. Both approaches to evaluating a performance-based system proved to be viable as techniques to determine whether a new analytical method for a given parameter could be used for monitoring purposes. The results of this pilot study are in preparation for a peer-reviewed publication.

Develop a framework to compare biological assessment methods and their data (Biology Workgroup)

All monitoring data ultimately require some form of field sampling and sometimes direct field measurements. The performance of many of these methods has not been adequately documented nor has there been a comprehensive framework for characterizing performance of field methods. The MDCB recognizes that field method performance is an area in need of attention as sampling-induced error or bias can often be far larger than that associated with laboratory analysis. The Biological Methods Workgroup of the Board has developed a draft issue paper describing procedures for documenting precision of field collection methods for stream benthic macroinvertebrates. Using case study data derived from several areas of the U.S., this paper specifies several ways in which the precision of a given field collection or taxonomic identification method can be determined. The Board is also assisting USEPA, USGS, and other agencies in developing a framework for characteriz-

ing the performance of biological field sampling methods and for determining comparability of data using different methods. As part of this collaboration, the Board is developing pilot studies that will examine performance and comparability of several field stream benthic macroinvertebrate sampling methods.

Development of a National Environmental Methods Index for method selection and comparison of critical method parameters (NEMI Workgroup)

The selection of analytical methods is a critical part of environmental monitoring program planning. During planning, monitoring objectives lead to criteria for the monitoring program. Field procedures and analytical methods are selected based upon these criteria, often in conjunction with sampling designs. Limitations of analytic techniques often determine the evaluative powers of the entire program, and hence proper selection of analytical methods is paramount.

NEMI is a web-based searchable compendium containing chemical, physical, radiochemical, microbiological and biological field and laboratory methods, including protocol summaries. It will allow the rapid communication and comparison of critical parameters of methods for use with methods selection and (or) methods modification and data comparability. It includes more than 40 data fields such as instrumentation, media and matrices, sampling information, sample preservation and storage conditions, detection levels, bias, precision, and other QA/QC requirements. The NEMI database ensures that the consideration of analytical methods is a more active part of planning and implementation of programs. Typical users of NEMI are expected to include regulators, regulated parties, scientists, volunteer monitoring groups, and watershed planning organizations.

The database is being developed in three phases. The first phase, which was completed in March 2001, involved looking at similar databases used by other groups to develop a data dictionary, business rules, user requirement rules, and design development using an ORACLE database structure. The second phase will incorporate reviewer comments of Phase 1 and create the functional, web-enabled user interface with the NEMI database design to meet user requirements. Phase 2 is expected to be completed by December 2001. Phase 3 includes updating methods in the database and adding new methods on an ongoing basis.

Develop and recommend a core set of data elements for reporting water quality monitoring results and for allowing data comparison (WQDE Workgroup)

In a cooperative effort, the USEPA and the Methods Board have developed and recommended a core set of data elements for reporting water quality monitoring results, to

be voluntarily implemented, that would allow data to be compared regardless of, but recognizing, the purpose of the monitoring activity.

A core WQDE list (contains about 30 elements) has been developed for chemical and microbiological data. The list is comprised of several types of information: site location; sample times; sampling objective; sample information; and analyses information. The list has undergone broad agency and organization reviews by the USEPA, the Methods Board and the National Water Quality Monitoring Council. The list was announced in the Federal Register in March 2001 and public meetings were held in Chicago, Denver, San Francisco, and Washington, D.C. to accept public comment on the list.

An additional list of core elements for field and other laboratory biological methods will be developed by the Board in the near future.

Develop and promote a MDCB position on laboratory and field accreditation, and coordinate with NELAC (Accreditation Workgroup)

The MDCB recognizes that the consistent, rigorous accreditation of laboratories which report data is necessary to the collection of better water data. Currently, efforts are underway through the National Environmental Laboratory Accreditation Program (NELAP) to establish a national reciprocal accreditation program in the U.S. The MDCB developed a position paper and primer that explain to the monitoring community at large why accreditation is important to the quality of monitoring data and why federal laboratories or laboratories performing analyses for federal agencies should be accredited by a national program. The MDCB also recommends the best, most viable approach to solve the problem given the options currently available.

Members of the MDCB Accreditation Workgroup are active participants in the development of NELAP. The expansion of the program to accreditation of field activities is an important next step in the ongoing process of data quality assurance.

Future Methods Board activities

New Technologies

Why are new technologies of interest? In part, because data quality is improved, through increased sensitivity, specificity, accuracy, and precision. Additionally, new technologies may provide cost savings due to reduced materials and labor costs. In some cases, reduced cost translates into an increase in data quantity (e.g. remote or *in situ* monitoring—increased frequency, distribution of sampling and analysis), which ultimately results in improved data quality. The Methods Board will be investigating new technologies that offer the possibility of improved protection of ecological and human health.

DQO/MQO Development

Data Quality Objectives (DQOs) and Measurement Quality Objectives (MQOs) are or should be the foundation of all monitoring studies as these define the questions needing answers and the data quality needed to answer those questions (USEPA 1994; ITFM 1995b; MDCB 1999). MQOs are statements that contain specific units of measure such as percent recovery, percent relative standard deviation, standard deviation of X micrograms per liter, or detection level of Y parts per billion. They should be thoroughly specified to allow specific comparisons of data to an MQO. DQOs are statements that define the confidence required in conclusions drawn from data produced by a project (USEPA 1994).

The MDCB will be compiling relevant information produced by several agencies to develop clear guidance on how to define DQOs and MQOs using real-world examples from the water quality monitoring field. An issue paper developed by the Board entitled "Towards a Definition of a Performance Based Approach to Laboratory Methods", presented at the 1999 Water Quality Technology Conference, defined DQOs and MQOs and discussed the importance of these concepts to performance-based monitoring approaches (MDCB 1999).

Nutrient Water Quality Criteria

In the near future, the Board will be using a DQO/MQO approach to develop and implement a pilot study examining nutrient method performance and data comparability in reference to ambient nutrient water quality criteria.

Additional information, including documents referenced in this fact sheet, can be obtained through the Methods Board web site:

<http://srvdwimdn.er.usgs.GOV/pmethods/>

Information can also be obtained from:

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